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Effectiveness of local antibiotic delivery with an osteoinductive and osteoconductive bone-graft substitute

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BACKGROUND: The morbidity associated with open fractures and open fracture treatment is well established. An osteoinductive and osteoconductive bone-graft substitute that prevents infection would decrease the number of procedures required to treat contaminated fractures by eliminating the need for surgical removal of cement beads and perhaps autograft harvest. We hypothesized that the combination of tobramycin-impregnated calcium sulfate pellets and demineralized bone matrix would prevent the establishment of infection in a contaminated fracture model. METHODS: A unicortical 12-mm-diameter defect was created in the proximal tibial metaphysis of twenty-nine Spanish goats. After contaminating the wounds with an infective dose of Staphylococcus aureus, we divided the animals into four groups. The negative control group received no treatment, the positive control group received tobramycin-impregnated polymethylmethacrylate beads, the demineralized bone matrix group received 2.5 mL of demineralized bone matrix, and the experimental group received tobramycin-impregnated calcium sulfate pellets with 2.5 mL of demineralized bone matrix. Radiographs were made and intraosseous tissue cultures were performed on postoperative day 21. RESULTS: The cultures showed no evidence of intramedullary infection in the experimental or the positive control group, but they were positive for Staphylococcus aureus in six of the seven goats in the negative control group and seven of the eight goats in the demineralized bone matrix group. CONCLUSIONS: The combination of tobramycin-impregnated calcium sulfate pellets and demineralized bone matrix was effective in preventing intramedullary Staphylococcus aureus infection in a contaminated goat fracture model.